

Zeros to Sketches

Factor, plot, and describe polynomial graphs.

HIGH SCHOOL • HSF-IF.C.7c

CCSS.Math.Content.HSF-IF.C.7c "Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior."

NAME _____

DATE _____

FROM FACTORS TO A GRAPH

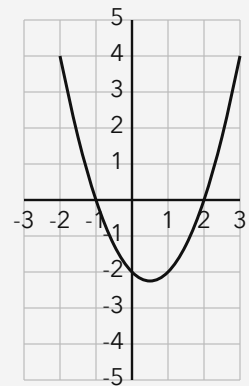
Find the zeros from the factors. Plot intercepts and extra points between zeros. Odd multiplicity means crossing; even multiplicity means touching and turning. The leading term determines end behavior. Sketch the visible part on the grid, and describe how the graph continues beyond it.

WORKED EXAMPLE

Graph $g(x) = (x + 1)(x - 2)$. Identify its zeros and end behavior.

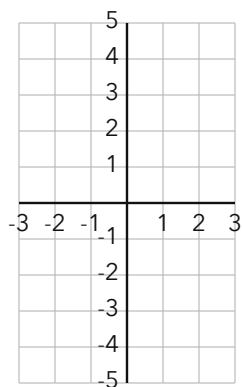
1. Set each factor equal to zero: $x = -1$ and $x = 2$.
2. Plot $(-1, 0)$, $(2, 0)$, and the y-intercept $(0, -2)$.
3. The axis of symmetry is $x = 0.5$ and the vertex is $(0.5, -2.25)$.
4. The positive quadratic leading term means both ends rise. Draw the parabola through these points.

Answer: The graph crosses at $x = -1$ and $x = 2$; both ends rise.



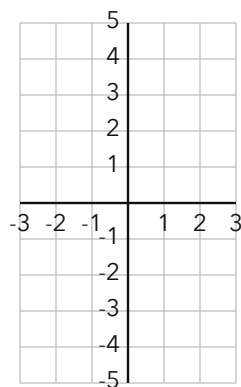
PRACTICE 4 problems

- 1** Sketch $y = (x + 2)(x - 1)$. Label the zeros and at least one extra point, and state the end behavior.



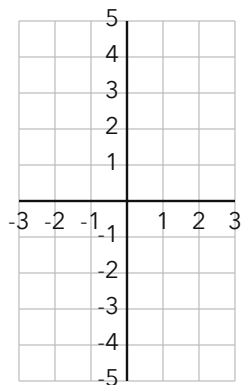
ANSWER _____

- 2** Sketch $y = -(x + 2)(x - 2)$. Label the zeros and at least one extra point, and state the end behavior.



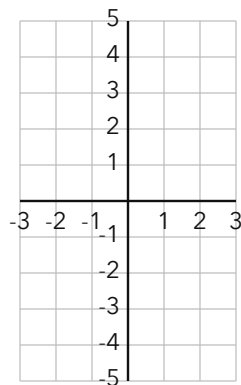
ANSWER _____

- 3** Sketch $y = x(x + 1)(x - 2)$. Label the zeros and at least one extra point, and state the end behavior.



ANSWER _____

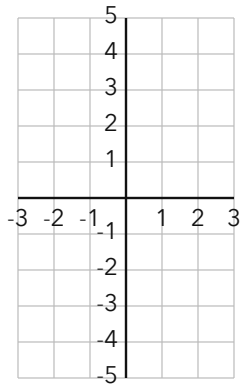
- 4** Sketch $y = -x(x + 2)(x - 1)$. Label the zeros and at least one extra point, and state the end behavior.



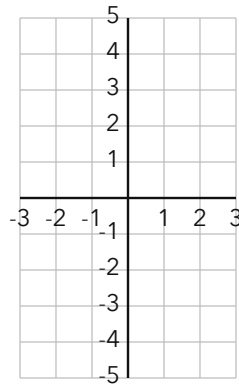
ANSWER _____

APPLY IT Show your work**1**

An idealized ball-height model is $h(t) = t(2 - t)$, with t in seconds and h in meters. On the grid, use the horizontal axis for t and the vertical axis for h . Sketch only $0 \leq t \leq 2$. When is the ball on the ground, and what is its maximum height?

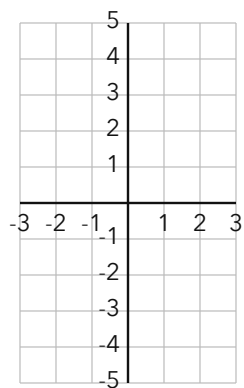
**ANSWER** _____**2**

A simplified profit model is $P(x) = x(x - 1)(x - 2)$, where x is tickets sold in hundreds. Sketch the visible part of the polynomial on the grid, label the zeros, and state its end behavior. Which zeros represent nonnegative ticket amounts?

**ANSWER** _____

CHALLENGE One step up

Sketch $f(x) = (x - 1)(x - 1)(x + 2)$. Label its zeros. Explain which zero crosses the axis, which touches and turns, and the end behavior.



WORK SPACE AND ANSWER

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Sketch $y = (x + 2)(x - 1)$. Label the zeros and at least one extra point, and state the end behavior.	Zeros -2 and 1 (crossings); y-intercept (0, -2); vertex (-0.5, -2.25); both ends rise.
2	Sketch $y = -(x + 2)(x - 2)$. Label the zeros and at least one extra point, and state the end behavior.	Zeros -2 and 2 (crossings); vertex and y-intercept (0, 4); extra points (-1, 3), (1, 3); both ends fall.
3	Sketch $y = x(x + 1)(x - 2)$. Label the zeros and at least one extra point, and state the end behavior.	Crosses at -1, 0, 2. Extra points (-0.5, 0.625), (1, -2). Left end falls; right end rises.
4	Sketch $y = -x(x + 2)(x - 1)$. Label the zeros and at least one extra point, and state the end behavior.	Crosses at -2, 0, 1. Extra points (-1, -2), (0.5, 0.625). Left end rises; right end falls.

PART 2 · APPLY IT

- On the ground at 0 and 2 seconds; maximum height 1 meter at $t = 1$ second. Only the arch from $t = 0$ to $t = 2$ represents this flight.** Accept an arch through (0, 0), (1, 1), (2, 0), restricted to $0 \leq t \leq 2$; $h(0.5) = h(1.5) = 0.75$.
- Zeros: 0, 1 and 2, representing 0, 100 and 200 tickets. Left end falls and right end rises.**
Negative x is part of the mathematical graph but does not represent ticket sales. Crosses at 0, 1, 2. Extra points (0.5, 0.375), (1.5, -0.375), (2.5, 1.875). Multiply each zero by 100 for tickets.

CHALLENGE

Crosses at $x = -2$; touches and turns at $x = 1$ (multiplicity 2). Key points: (-2, 0), (-1, 4), (0, 2), (1, 0), (2, 4). Left end falls and right end rises.

Check sketches against the listed zeros, crossing/touching behavior, extra points and end behavior. Connect smoothly; a plotted table alone is not a sketch. Grids show a window; arrows or descriptions indicate continuation. Each grid step is one unit.